

699-S6-E4K (C4072)

Log Data Report

Borehole Information:

Borehole: 699-S6-E4K (C4072)			Site: 618-10 Burial Ground		
Coordinates (WA State Plane)		GWL (ft)¹: 65.5	GWL Date: 2/20/2003		
North N/A ³	East N/A	Drill Date 2/20/2003	TOC² Elevation NA	Total Depth (ft) 87.3	Type Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded Steel	1.66	11 3/4	10 3/4	1/2	+1.66	88.0
The geologist was the source for the casing information and all depths.						

Borehole Notes:

Zero reference is the ground surface. This borehole was logged through the drill pipe. This borehole is located approximately 40 ft southeast of the 618-10 Burial Ground.

Logging Equipment Information:

Logging System: Gamma 3E (RLS-1)	Type: 70% HPGe
Calibration Date: 10/02	Calibration Reference: GJO-2002-386-TAR
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2/Repeat	3	4	5
Date	2/20/03	2/20/03			
Logging Engineer	Kos	Kos			
Start Depth (ft)	0.0	86.0			
Finish Depth (ft)	86.0	77.0			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	1.0	1.0			
ft/min	n/a ⁴	n/a			
Pre-Verification	CE101CAB	CE101CAB			
Start File	CE101000	CE101087			
Finish File	CE101086	CE101096			
Post-Verification	CE111CAA	CE111CAA			
Depth Return Error (in.)	0	1 low			

Log Run	1	2/Repeat	3	4	5
Comments	See logging notes below.	None			

Logging Operation Notes:

Zero reference was the ground surface, and the borehole was logged through drill pipe. Logging was performed with a centralizer installed on the sonde. Data were collected using Gamma 3E, HO 68B-4330. Pre- and post-survey verification measurements for the RLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 118. Fine-gain adjustments were made after files CE101020 and CE101080 to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel. The bottom 2 ft of this borehole appeared to be mud (higher count rate).

Analysis Notes:

Analyst:	Sobczyk	Date:	2/27/03	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day and compared to the control limits established on 12/05/2002. The verification spectra were all within the control limits. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for the day were stable and between 1 and 3 percent of one another.

SGLS log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G3Eoct02.xls), using parameters determined from analysis of recent calibration data. Zero reference was the ground surface. Data were analyzed using a uniform casing correction based on a casing thickness of 0.5 in. to a depth of 86 ft. This casing thickness was measured at the wellhead. A water correction was applied to the data below 65.5 ft.

For the 70% HPGe detector, dead time at background count rates varies from 2 to 6 percent, averaging about 4 percent. Dead time corrections are required when dead time exceeds 18 percent. As the dead time did not exceed 18 percent, a dead time correction was not needed or applied.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, gross gamma and volume fraction of water, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

At the bottom of the borehole, the KUT concentrations appear abnormally high. The apparent concentrations are elevated because the sonde is near the open end of the drill pipe, and the casing correction is overcompensating for the shielding effect of the drill pipe. Thus, the KUT concentrations were plotted at the usual scales, and the KUT concentrations were allowed to go off-scale at the bottom of the borehole.

Results and Interpretations:

Man-made radionuclides were not detected in this borehole. ^{137}Cs was indicated at 77 ft during the repeat survey. After examination of the spectrum at this depth, it was determined that there is no evidence of a photopeak at 662 keV. This reported peak is probably the result of statistical fluctuation.

The plots of the repeat logs demonstrate reasonable repeatability of the RLS data for the natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV.

¹ GWL – groundwater level

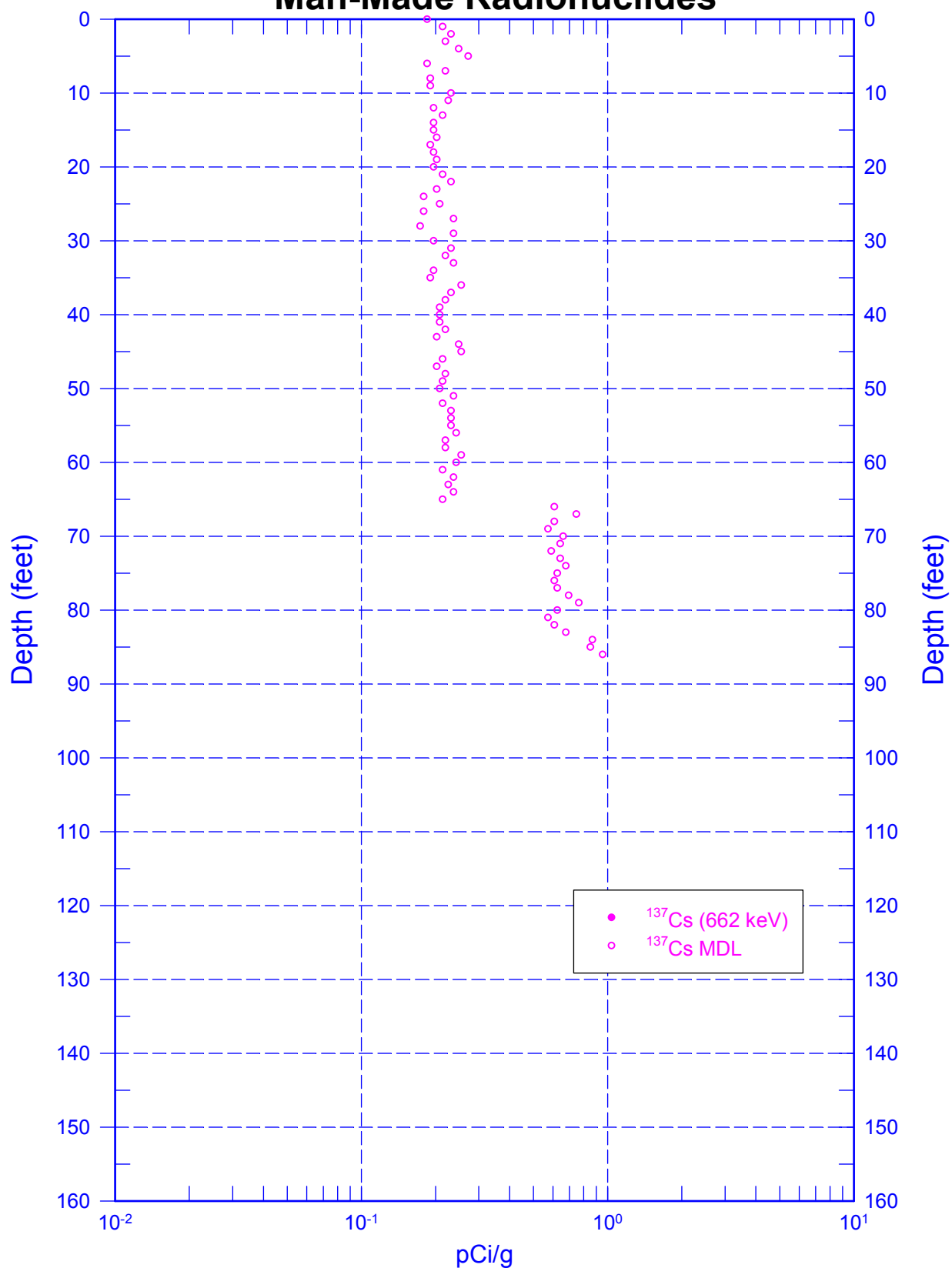
² TOC – top of casing

³ N/A – not available

⁴ n/a – not applicable

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Man-Made Radionuclides

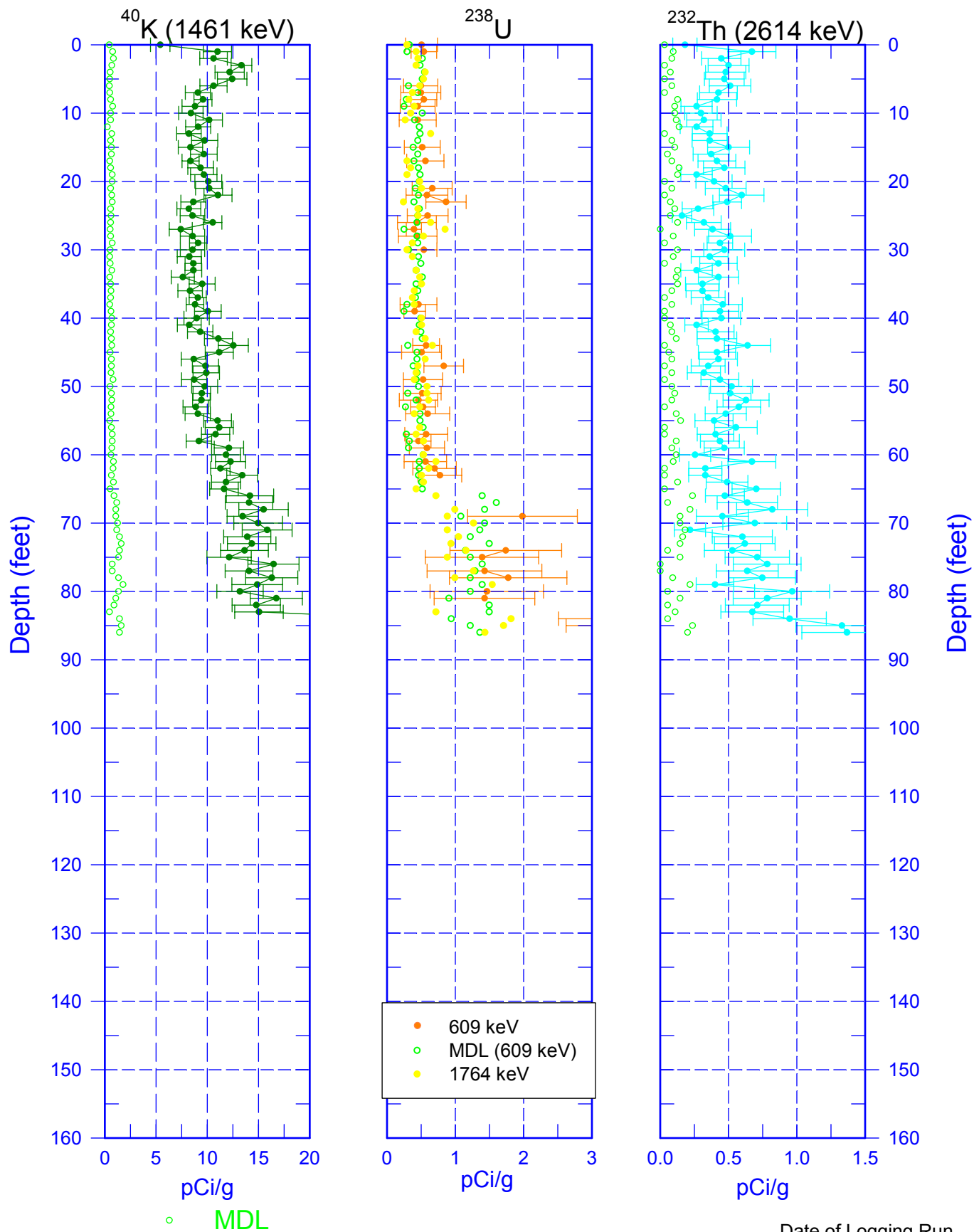


Zero Reference = Ground Surface

Date of Logging Run
2/20/2003

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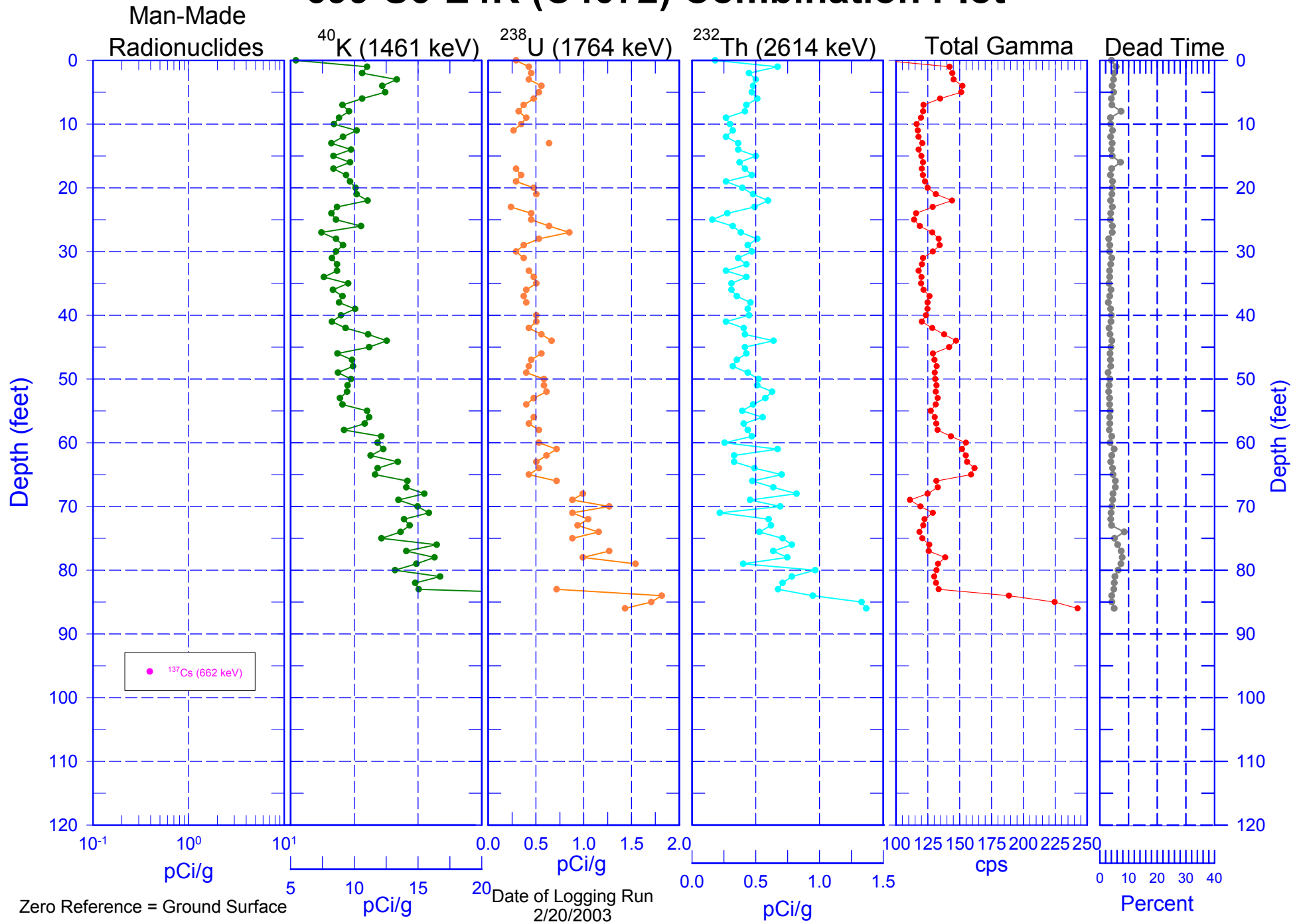
Natural Gamma Logs



Zero Reference = Ground Surface

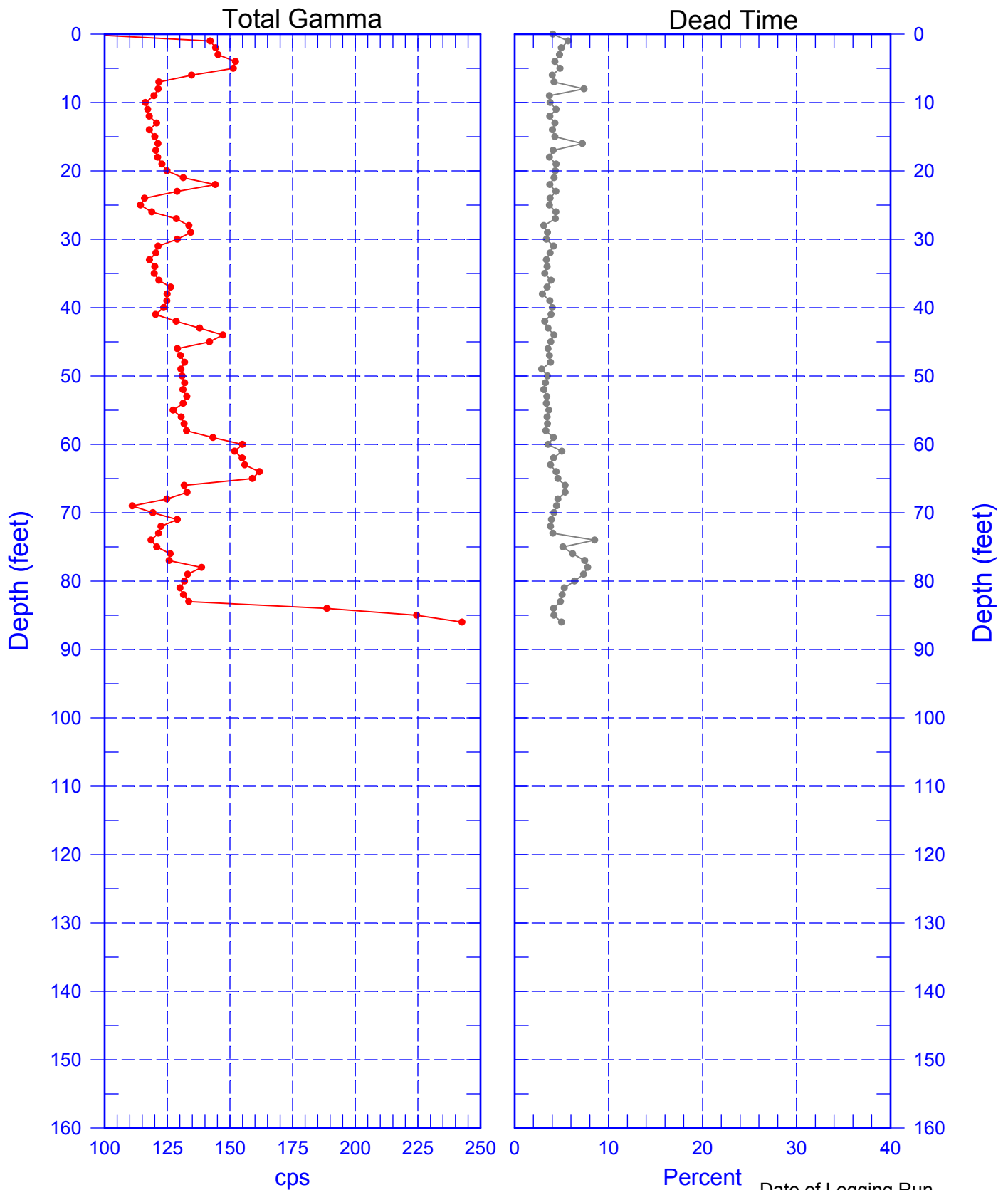
Date of Logging Run
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699-S6-E4K (C4072) Combination Plot



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Total Gamma & Dead Time



Date of Logging Run
2/20/2003

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Rerun of Natural Gamma Logs (75.0 to 85.0 ft)

